

地方低碳发展行动方案开发工 具和国际政策实践介绍

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U.S. DEPARTMENT OF
ENERGY



University of California



Cities Need Go Eco and Low Carbon

城市需要生态低碳发展

Cities today...

- ...cover **2%** of the earth's surface
- ...contain **50%** of the world's population
- ...consume **75%** of global energy
- ...produce **80%** of greenhouse gas emissions



Eco-garden City

- MOHURD, since 1992
- By end of 2010, **184** cities have been named “National Garden City”

Eco-city

- MEP, since 2003
- By July of 2011, **38** cities have been named “Ecological City (County)”

Low Carbon City

- NDRC, since 2010
- By February 2011, **133** cities have set targets for “low-carbon cities”

Low Carbon Eco City

- MOHURD, since 2011

What is a Low Carbon City? 什么是低碳城市?

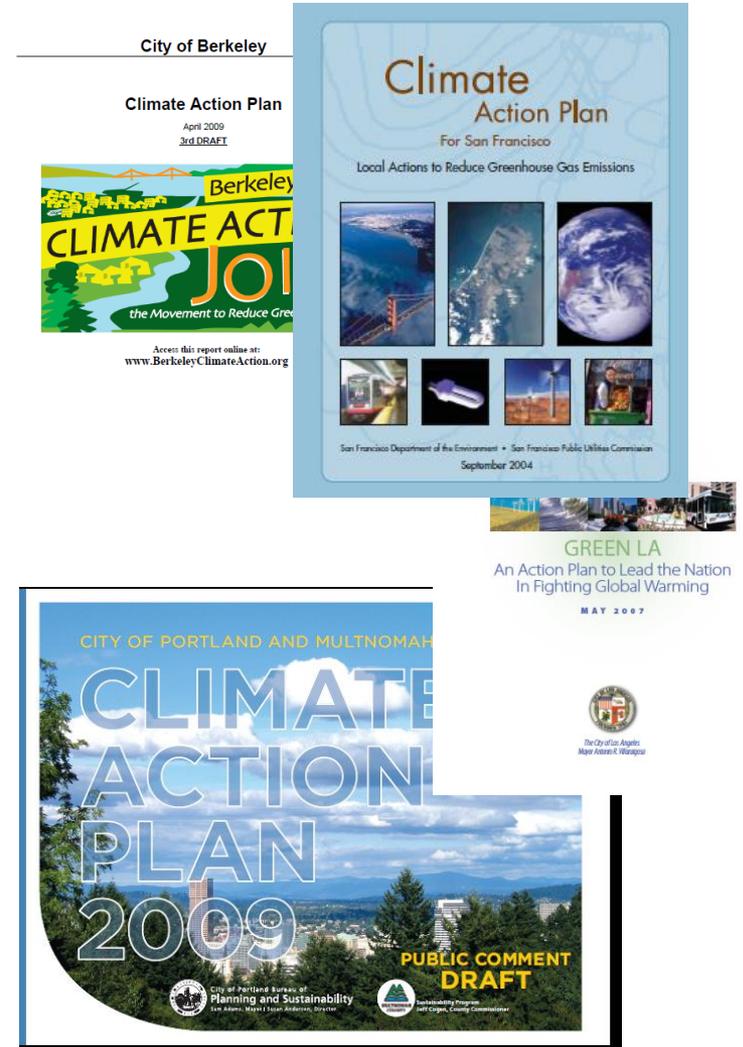


- Lack of specific definition 缺乏低碳城市定义
- Lack of indicator system 缺乏低碳城市的指标体系
- Lack of guidelines on design and implement a low carbon plan 缺乏设计和执行低碳城市规划的指导方针
- Lack of assessment and policy recommendation tools tailored for local cities 缺乏适用于地方城市的低碳评价和政策推荐工具

一份可操作的科学有效的低碳发展方案应包括什么？ - 基于国际经验



- 气候变化
 - 国际国内省内现状，总量，人均
 - 对本省的影响（海平面上升，水资源，生态系统，健康，农业，经济）
- 本省情况介绍
 - 宏观经济，各项政策及实施情况介绍
- 碳排放清单分行业分燃料
- 未来排放预测，情景分析结果
- 排放减少目标制定
- 实现目标的政策措施选择及各政策措施的减排量
 - 已有政策，新建议政策
- 政府的政策实施方案
 - 部门分工责任制，资金，人员的保障
- 实施效果力度评估监督机制



地方政府制定低碳行动方案的技术工具和政策选择

简单描述制定地方低碳发展规划和行动方案的步骤和技术工具

总结提炼国内外成功的低碳发展行业政策和措施清单

基于国际实践，探讨建立适合中国国情的区域低碳发展评价体系

适用于省级或市级低碳发展规划



ERNEST ORLANDO LAWRENCE
BERKELEY NATIONAL LABORATORY

A Low Carbon Development Guide for Local Government Actions

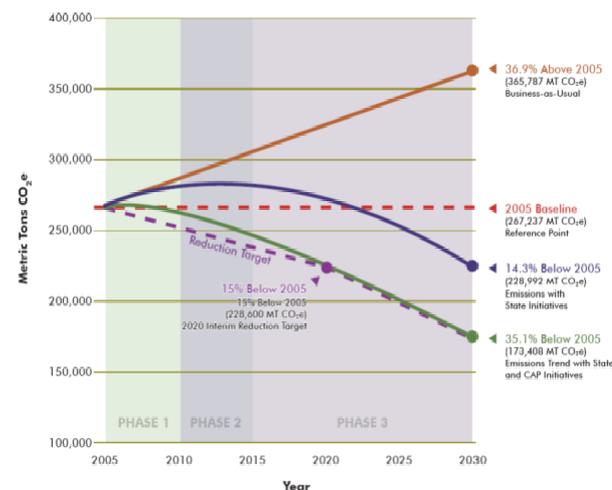
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December 2010 (interim)

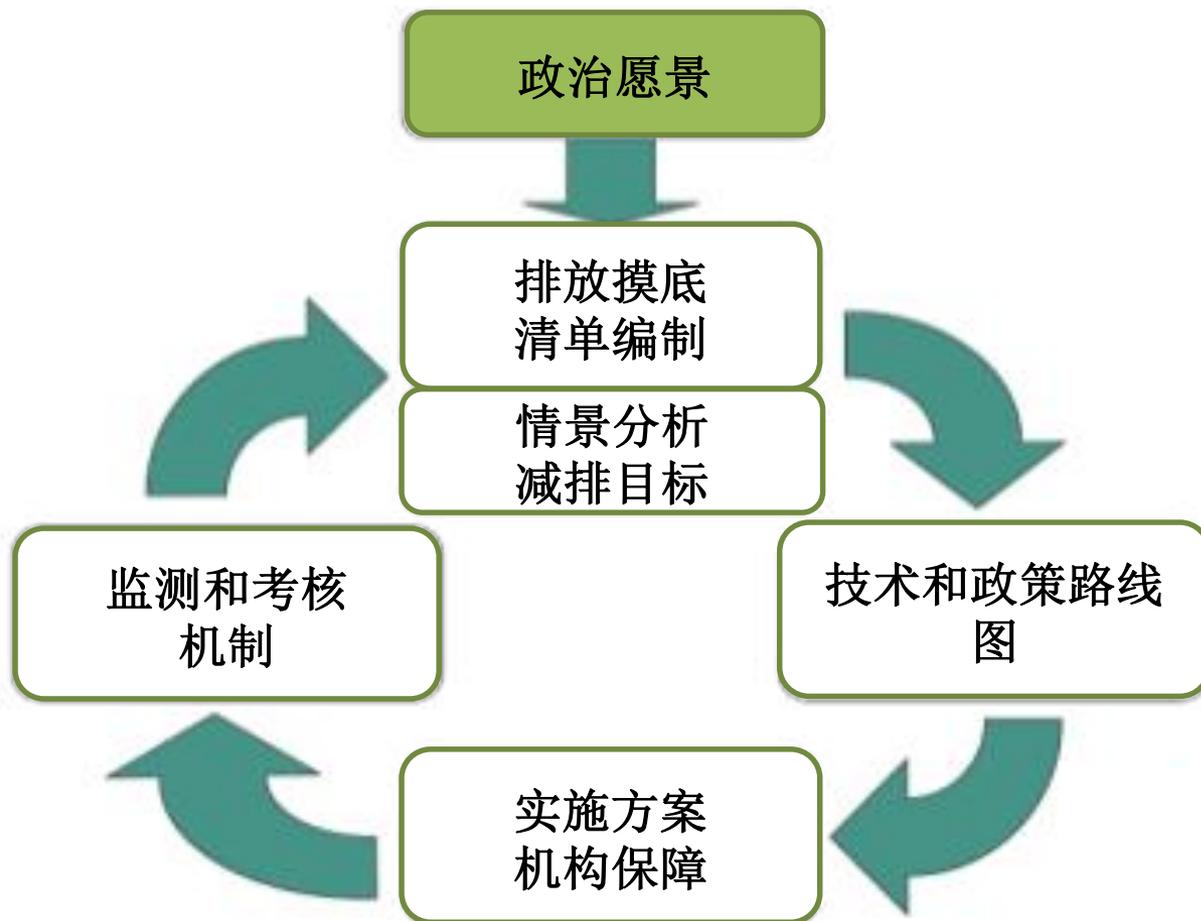


2030 Emission Reduction Scenarios in San Carlos



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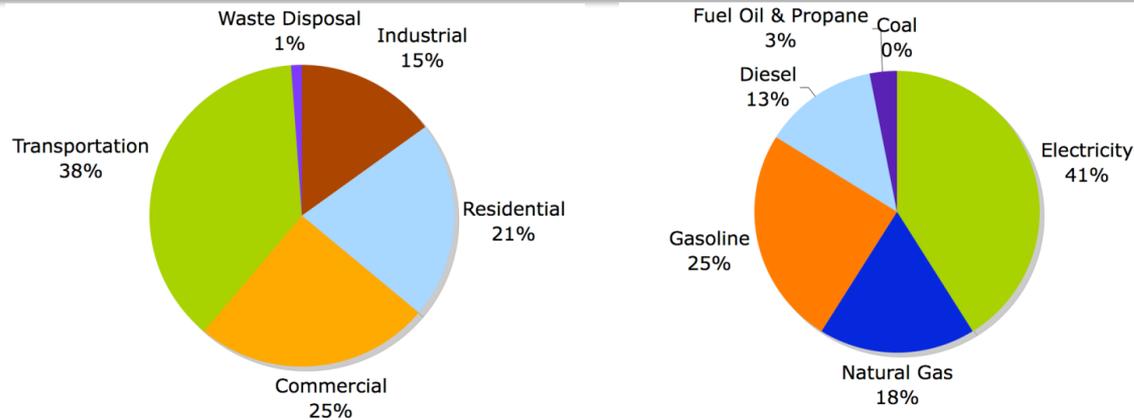
制定低碳发展规划和行动方案的步骤和技术工具概览



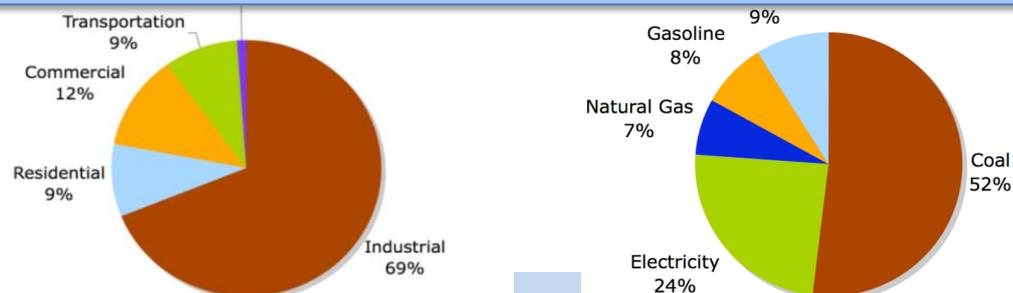
- 碳排放主要来源：二氧化碳和甲烷
- 排放清单是对省市中的排放量的一个最好的估计，而非一个准确的度量
- 建立的排放基线不必要和服务于国际信息通报义务的国家清单有直接联系，而是供国内政策制定和实施的需求；因此，重要的是确保方法统一、数据质量可控，使得地区间和地区内部不同年份间的清单具有可比性
- 排放清单包括的二氧化碳和甲烷主要来自：电力、工业、生活、商业、交通和土地管理（农业和其他的土地使用，农业和城市），以及废弃物

编制清单 Emission Inventory

美国典型城市的分行业和分燃料类型的二氧化碳排放清单 GHG Emissions Inventory for Portland, Oregon by Sector and by Fuel Source



中国典型城市的分行业和分燃料类型的二氧化碳排放清单 CO2 Emissions Inventory for a Typical Chinese City by Sector and by Fuel Source



温室气体排放清单的构成

Components of a Greenhouse Gas Emissions Inventory



部门 Sector	数据和排放的来源 Data/ emission source
电力部门 Electric Power Sector	电力生产的能源消费结构：煤炭、天然气、石油、水力、风力、太阳能和核能的发电消耗 Energy mix of generation: kWh from coal, natural gas, oil, hydro, wind, solar, nuclear, etc.
工业部门 Industrial sector	电力和燃料（煤炭、天然气、热力、其他）的能源消耗 Electricity and fuel (natural gas, coal, heat, others) consumption
生活部门 Residential sector	耗电量，煤炭，天然气，石油、热力，其他的能源消耗 Electricity and fuel (natural gas, coal, heat, others) consumption 建筑面积和建筑类型 Building floor space and type
商业部门 Commercial sector	耗电量，煤炭，天然气，石油、热力，其他的能源消耗 Electricity and fuel (natural gas, coal, heat, others) consumption 建筑面积和建筑类型 Building floor space and type
交通部门 Transportation sector	耗电量，煤炭，天然气，石油、热力，其他的能源消耗 Electricity and fuel (gasoline, diesel, others) consumption 车辆型号的构成及车辆的能效 Transport modal mix and fleet efficiencies (feet, bicycle, motorbike, bus, light rail, train, auto, truck) 在地方道路上车辆的里程数 Vehicle Miles Traveled (VMT) on Local roads, for each mode 在高速道路上车辆的里程数 VMT on highways (related to the jurisdiction) for each mode
土地使用 Land Use	稻米和其他粮食生产的公顷数 Hectares of rice and other food production 牛、猪和马的数目 Numbers of cattle, pigs, horses 森林覆盖率（现有的，移除的和新增的） Hectares of Forest cover (existing, removed, added)
废弃物 Waste	废弃物填埋的总数（吨） Total landfill waste (tonnes) 废弃物的典型构成情况（有机物、塑料和其他非降解材料，土地覆盖材料） Typical composition of waste (organic matter, plastics and other non-degradable material, land-cover materials)

编制清单 Emission Inventory :

确定排放范围边界



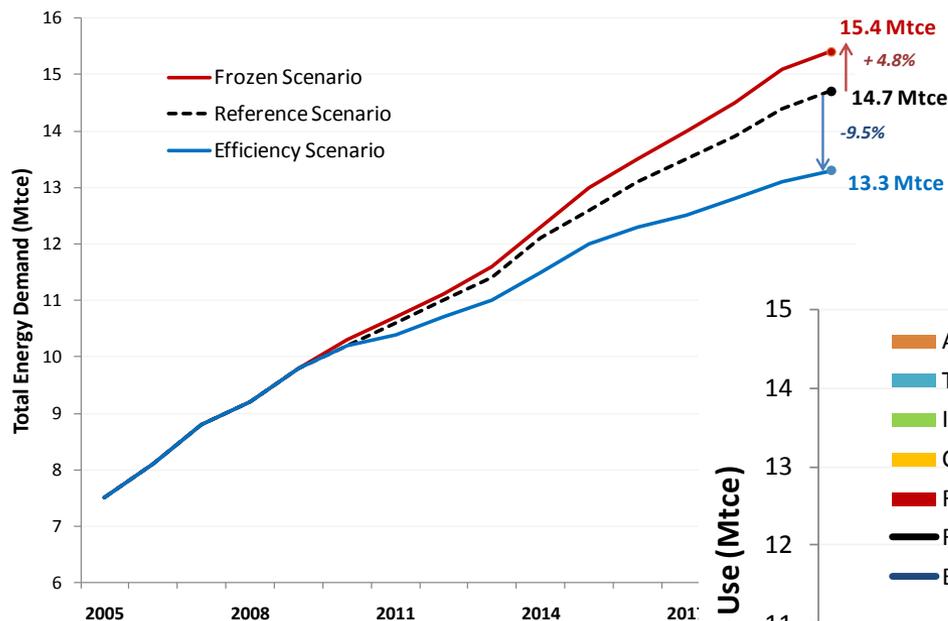
国际常用范围

排放范围	范围活动
范围1：直接排放： 在城市内产生	<ul style="list-style-type: none">▪ 城市内的直接能耗（工业、取暖、制冷、发电、基础设施等使用的燃料）▪ 城市内运输▪ 城市内土地利用和废物管理
范围2：间接排放： 由于城市内活动引起的，但在城市外产生的排放	<ul style="list-style-type: none">▪ 城市使用的电力和采暖进口
范围3：关联排放： 由于城市活动产生的，但在城市间或城市外发生的排放	<ul style="list-style-type: none">▪ 区域内运输▪ 城市外填埋区的城市废物

* 从外地调入的电量和热量，以及城市的交通能耗也必须纳入排放清单的计算中。在排放的各个领域和范围中，城市都有很大的减碳潜力。

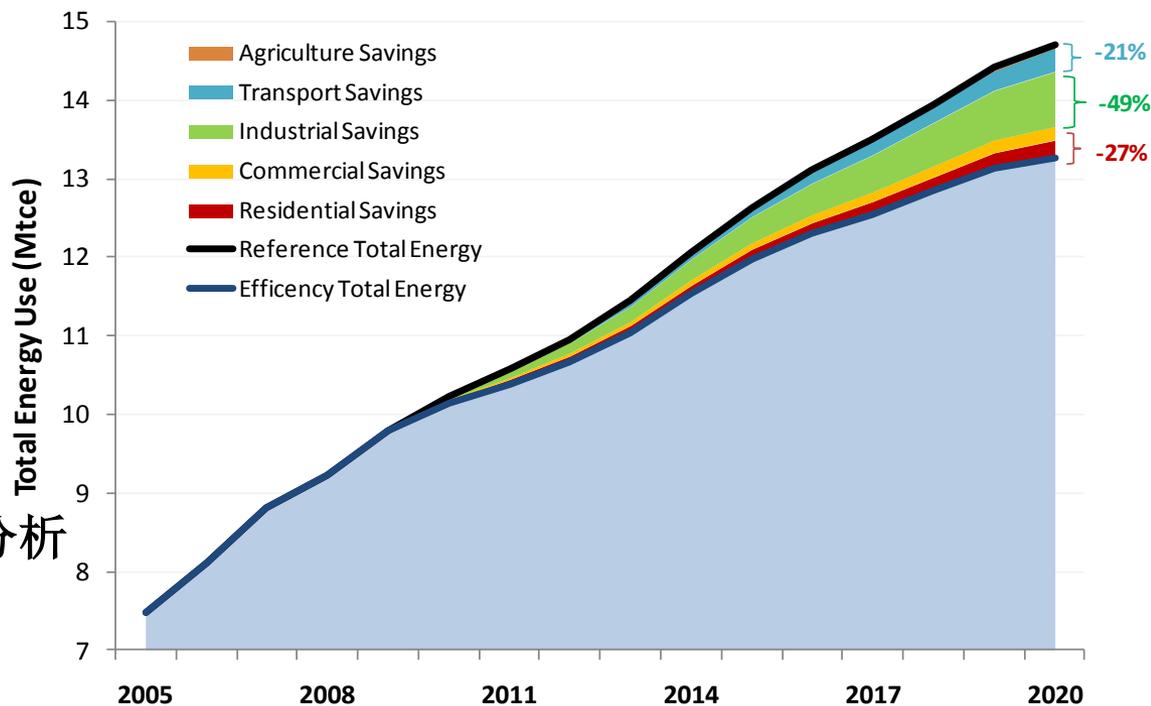
评估潜力并分解目标：行业减排目标

分析工具示例：情景分析工具（LEAP等）



目标的种类：

- 二氧化碳的排放（绝对值量，或变化的百分比）
- 节能量（绝对值量，或变化的百分比）
- 物理能源效率（对标或变化的百分比）
- 单位经济产出的碳强度（对标或变化的百分比）



能效提高带来的各部门减排潜力分析

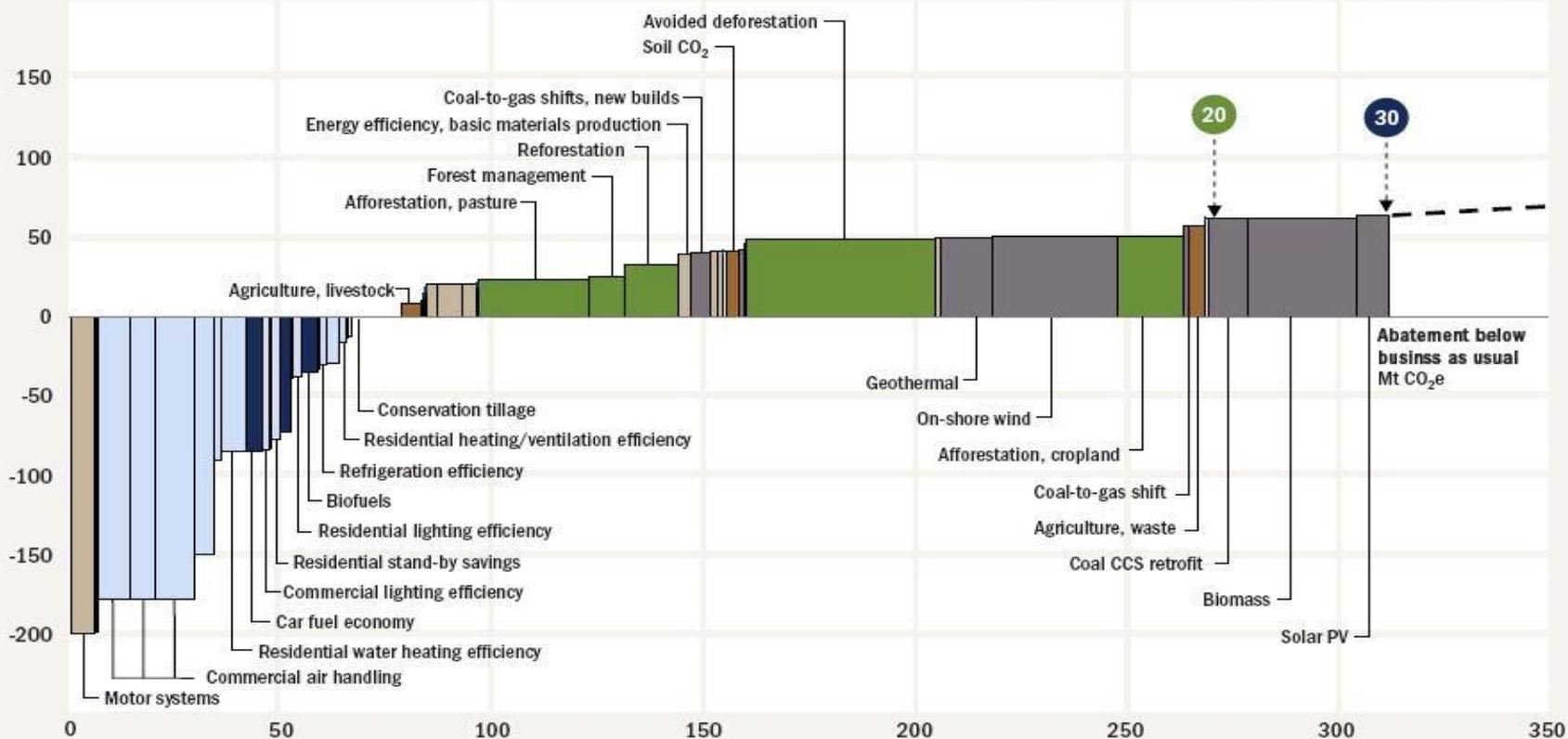
技术优选：技术路线图

分析工具示例：成本曲线或技术路线图指南（IEA等）

Australian 2020 carbon abatement cost curve

Cost of abatement
A\$/t CO₂e

- ⊗ Reduction below 1990 levels, percent
- Break-even point
- Industry
- Buildings
- Forestry
- Power
- Transport
- Agriculture



Note: Abatement opportunities are not additive to those of previous years

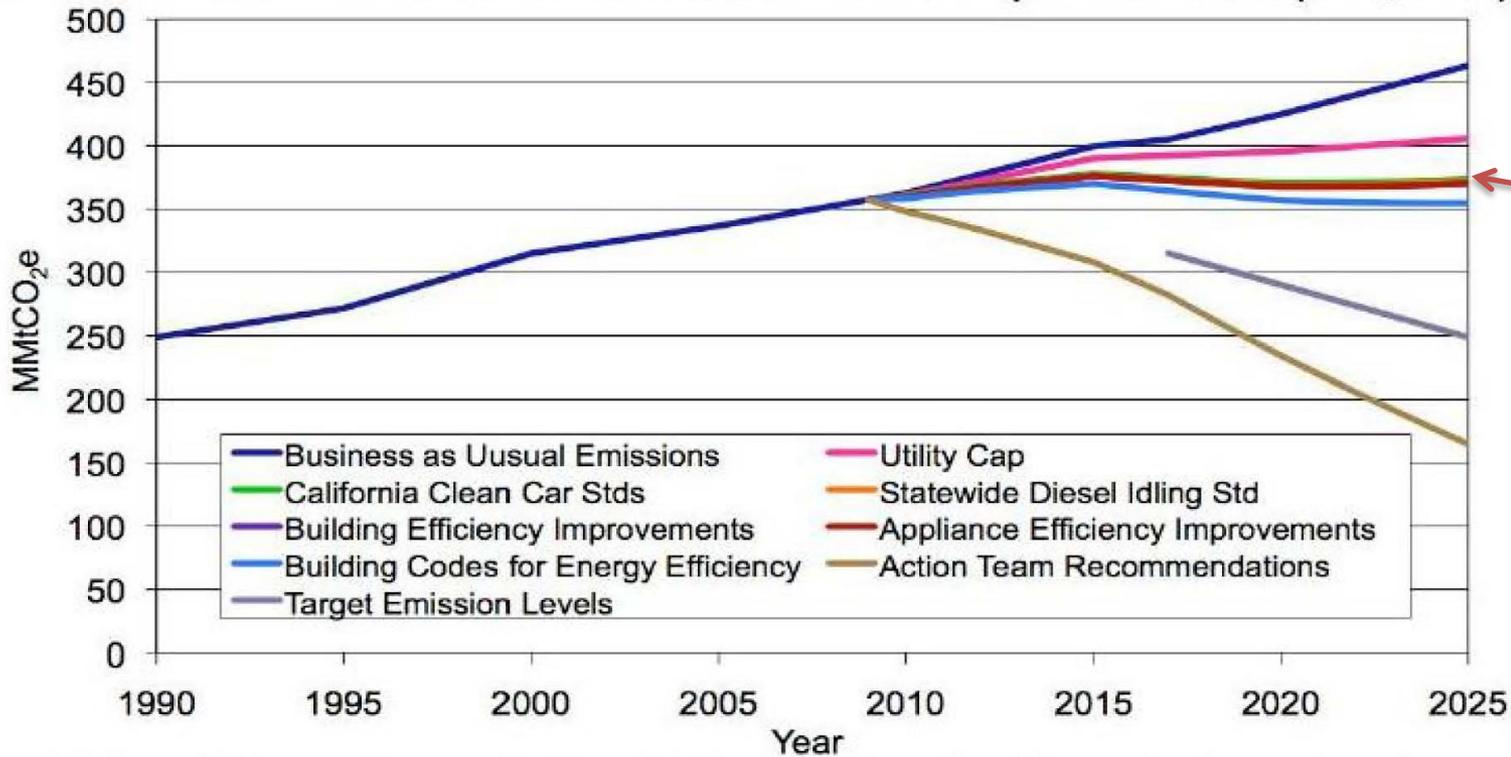
Source: McKinsey Australia Climate Change Initiative

澳大利亚2020碳减排减排成本估计

政策优选：政策路线图

分析工具示例：气候战略中心 Center for Climate Strategy

GHG Reduction Potential from Florida Recent and Proposed Actions (CCS, 2008)



示例：采纳加州的清洁汽车标准带来的减排量

实施不同政策选择的减排潜力- Center for Climate Strategy

采用不同的指标，得到不同的结果——宏观指标（第一层指标）



人均二氧化碳

Region	End-use CO2/capita
	tCO2/person
Guangxi	2.13
Sichuan	2.47
Yunnan	2.62
Jiangxi	2.73
Hainan	2.77
Hubei	2.85
Guizhou	2.91
Anhui	3.09
Hunan	3.67
Gansu	3.99
Shaanxi	4.02
Fujian	4.13
Chongqing	4.28
Henan	4.66
Heilongjiang	4.92
Guangdong	5.26
Qinghai	5.59
Jilin	5.87
Xinjiang	6.09
Zhejiang	6.11
Jiangsu	6.38
Shandong	7.29
Hebei	8.19
Beijing	8.69
Liaoning	8.98
Shanxi	9.59
Tianjin	10.82
Ningxia	11.85
Shanghai	11.95
Inner Mongolia	12.06

万元GDP二氧化碳

Region	End-use CO2/GDP
	kgCO2/RMB
Fujian	0.16
Beijing	0.17
Guangdong	0.17
Guangxi	0.17
Hubei	0.17
Zhejiang	0.17
Sichuan	0.19
Jiangsu	0.19
Hainan	0.19
Shanghai	0.19
Jiangxi	0.22
Tianjin	0.24
Yunnan	0.25
Hunan	0.25
Anhui	0.25
Shaanxi	0.26
Shandong	0.26
Heilongjiang	0.27
Chongqing	0.28
Henan	0.28
Jilin	0.29
Liaoning	0.34
Xinjiang	0.36
Qinghai	0.38
Gansu	0.39
Guizhou	0.39
Hebei	0.42
Inner Mongolia	0.44
Shanxi	0.56
Ningxia	0.78

LBNL开发的低碳指标

Region	LBNL Low Carbon Index
	Total Value
Fujian	82
Jiangsu	85
Zhejiang	85
Guangdong	87
Jiangxi	87
Guangxi	87
Sichuan	89
Shaanxi	91
Henan	95
Shandong	99
Hunan	99
Hubei	102
Anhui	104
Heilongjiang	108
Chongqing	112
Tianjin	117
Jilin	125
Liaoning	126
Yunnan	126
Hainan	129
Guizhou	134
Hebei	140
Xinjiang	145
Gansu	151
Shanxi	159
Beijing	165
Qinghai	180
Inner Mongolia	185
Shanghai	201
Ningxia	247

评估低碳发展状况的评估指标——基于能耗部门的低碳指标体系

——分部门指标(第二层指标)



- 提供了城市低碳或高碳的基本理由
- 为城市找到改进的地方，制定先后顺序，奠定了基础
- 建筑领域的能耗经过了气候修正，保证指标的可比性
- 建议在商业部门中采用单位平方米能耗的指标，但是需要收集更多的数据
- 权重因子根据各部门占总能耗的比例，以及用电量占总能耗的比例

地区	各部门终端能耗指标				电力 单位电力生产的 二氧化碳排放 kgCO ₂ /kWh
	居民生活	商业	工业	交通	
	人均居民生活 终端能耗 (气候修正数据) tce/人	单位就业人数 商业终端能耗 tce/人	单位工业GDP 工业终端能耗 tce/2005 RMB	人均交通 终端能耗 tce/人	
北京	0.491	1.090	0.915	0.489	0.664
天津	0.354	1.801	0.828	0.274	0.899
河北	0.217	0.728	1.868	0.093	0.995
山西	0.317	0.776	2.087	0.198	0.958
内蒙古	0.649	1.928	1.649	0.345	1.231
辽宁	0.301	0.603	1.428	0.276	1.039
吉林	0.263	0.789	1.519	0.188	1.256
黑龙江	0.375	0.730	0.962	0.096	1.040
上海	0.320	1.852	0.798	0.881	0.829
江苏	0.110	0.372	0.829	0.135	0.803
浙江	0.172	0.543	0.684	0.172	0.695
安徽	0.087	0.220	1.369	0.063	0.890
福建	0.154	0.599	0.817	0.151	0.563
江西	0.091	0.216	1.111	0.070	0.882
山东	0.140	0.933	0.985	0.200	0.975
河南	0.128	0.177	1.067	0.067	0.981
湖北	0.167	0.496	1.453	0.199	0.321
湖南	0.129	0.458	1.400	0.083	0.596
广东	0.256	0.524	0.633	0.208	0.659
广西	0.076	0.316	1.293	0.107	0.371
海南	0.091	0.561	1.788	0.266	0.566
重庆	0.147	0.285	1.583	0.149	0.797
四川	0.149	0.290	1.295	0.099	0.440
贵州	0.116	0.624	2.157	0.096	0.690
云南	0.065	0.315	1.953	0.127	0.558
陕西	0.195	0.698	0.929	0.144	0.847
甘肃	0.208	0.268	2.215	0.100	0.640
青海	0.454	1.053	2.507	0.172	0.314
宁夏	0.221	0.898	3.357	0.203	1.022
新疆	0.310	0.916	1.959	0.241	0.808

低碳发展指标——部门内指标(第三层指标)



供电部门

- 可再生能源发电比例 (%)
- 热电厂发电效率(gce/kWh) (gce/kWh)

工业部门

- 各重点耗能行业综合能耗(吨产品能耗 tce/ton)

公共建筑

- 建筑节能标准实施率(%)
- 节能建筑认证面积 (m²/total m²)
- 绿色建筑认证面积(m²/total m²)
- 建筑供热可再生能源利用率或建筑部门热电联产利用率 kWh/m²
- 采暖和空调单位能耗 (MJ/m²-HDD , MJ/m²-CDD)

居住建筑

- 建筑节能标准实施率(%)
- 节能建筑认证面积 (m²/total m²)
- 绿色建筑认证面积(m²/total m²)
- 采暖和空调单位能耗 (MJ/m²-HDD , MJ/m²-CDD)

交通部门

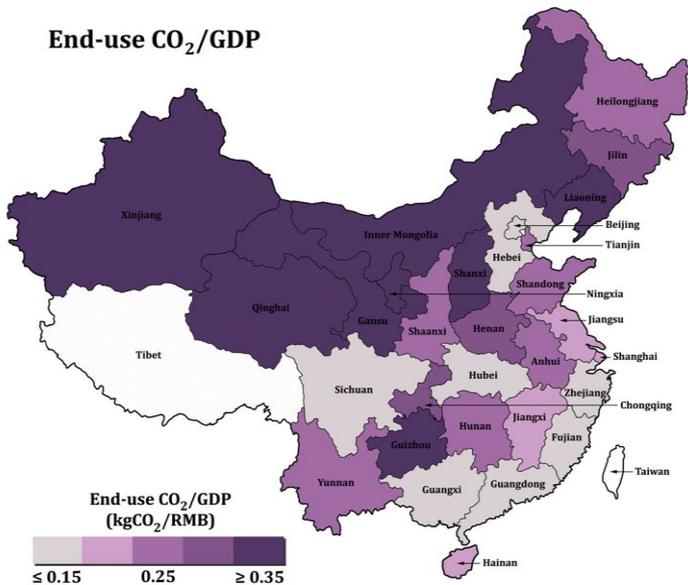
- 人均单位出行耗能或 CO₂ 排放(MJ/p-km, or ton of CO₂ /p-km)
- 单位货物运输耗能或 CO₂ 排放 (MJ/t-km, or ton of CO₂ /t-km)
- 车用清洁能源替代率(混合动力, CNG, 电动汽车, 天然气) (%)
- 公共交通分担率(平均每人出行次数)
- 每十万人占有公共交通里程数

土地利用 和废物利用

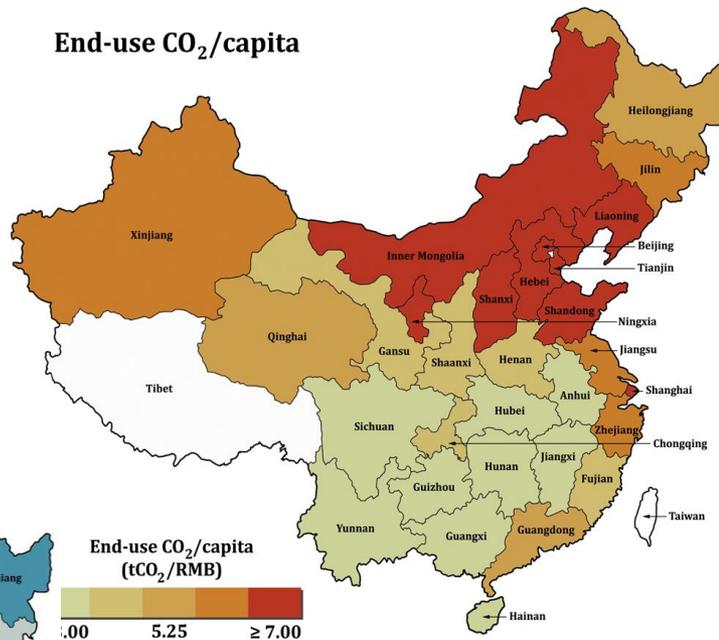
- 混合功能社区占比 (%)
- 森林覆盖率(%)
- 人均积肥率 (%)

利用不同指标的地区分布

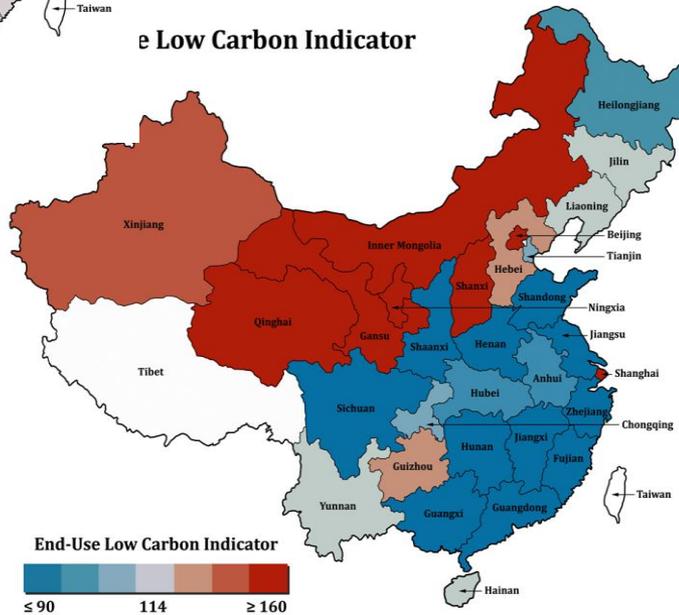
End-use CO₂/GDP



End-use CO₂/capita



e Low Carbon Indicator



很难公平的比较
不同能源结构和
经济结构的地区

Strategies for Local Low-Carbon Development

November 2012



Lawrence Berkeley National Laboratory:
Nan Zhou, Lynn Price, David Fridley,
Stephanie Ohshita, Nina Khanna
Energy Foundation:
Hu Min

Energy Research Institute:
Hu Xiulian



区域低碳发展战略

工业 Industry



1. 能源管理计划

Energy Management Programs

2. 确定基准线：同类企业和城市比较以及与基准的差距

Benchmarking: How Does an Enterprise or City Compare to its Peers and to Standards?

3. 能效评估

Energy-Efficiency Assessments

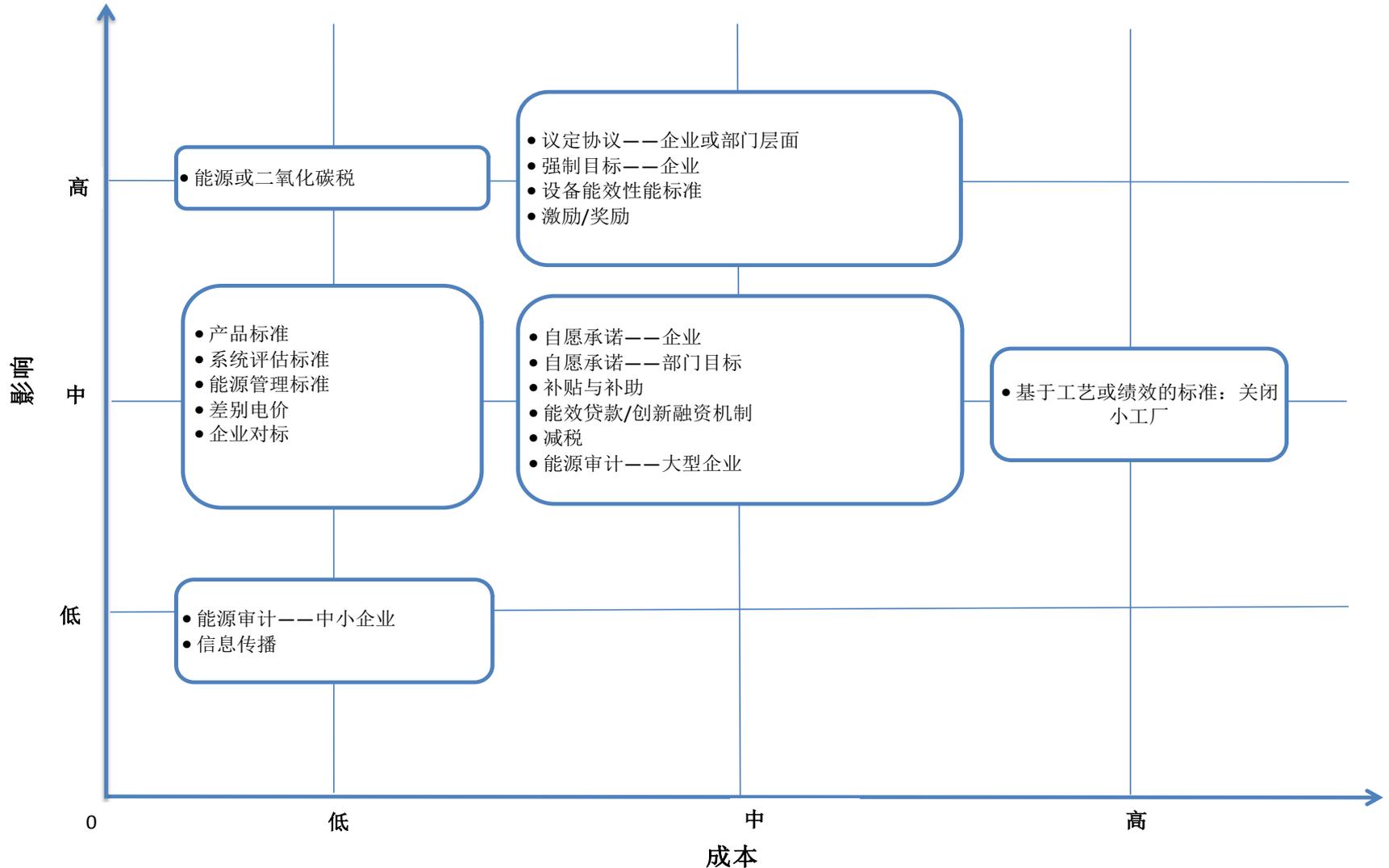
4. 自愿节能减排目标

Voluntary Energy-Savings Targets

5. 能源税和抵扣

Energy tax and rebate

低碳发展政策实践菜单及成本与效果：工业



- 目标：在1989到2000年，工业能效提高20%
- **Goal: increase industrial energy efficiency by 20% between 1989 and 2000**
- 可行的能效改进措施
 - Inventory of viable energy-efficiency improvement measures
- 签署目标设置协议
 - Target-setting agreements signed
- 开发节能计划
 - Energy Savings Plan developed
- 年度监测
 - Annual monitoring



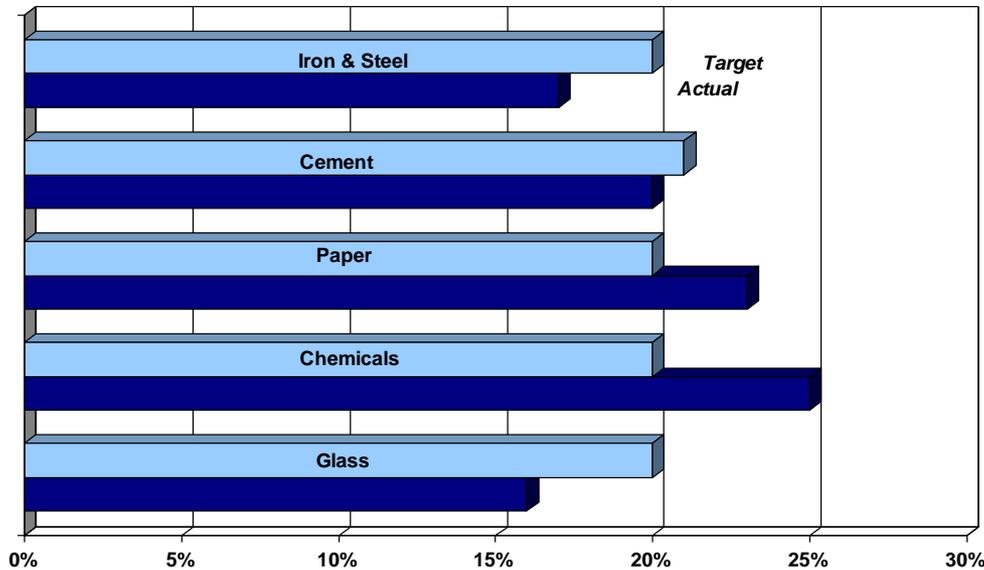
政策和方案的支持

Supporting Policies and Programs

- 补贴
- Subsidies
- 投资能源减少交税
- Energy investment tax reduction
- 信息传播
- Information dissemination
- 能源设备审计
- Facility audits
- 环境准入的简化手续
- Simplified procedure for environmental permits
- 能源政策的一致性和对项目的保护
- Consistency in and protection from new energy regulation in industry

荷兰 -长期能效协议

Netherlands Long-Term Agreements



% 提高的能效, 1989-2000

% improvement in energy efficiency, 1989-2000

结果 Results:

- 实现整体节能22.3%
- Overall energy efficiency savings of 22.3% realized
- 每减少一吨CO₂, 政府的成本为10-20美元, 这个差别取决于补贴的成本是否包括在内。
- Cost to government of program was \$10-20/tCO₂ saved, depending upon whether full costs of all subsidies are included
- 工业实现每年节约能源成本约6亿5千万美元
- Industry realizing ~\$650 M per year in reduced energy costs

英国气候变化协议

UK Climate Change Agreements



- 目标：到2010年降低20%的CO2排放量（1990年的基线）
- **Goal: 20% CO2 emissions reduction by 2010 (1990 baseline)**
- 气候变化税：对能源的征税（包括天然气，煤，液化气和电）
- **Climate Change Levy: tax on energy (natural gas, coal, LPG, electricity)**
- 如果公司同意并且实现降低温室气体排放量的目标后，公司的气候变化税将会有80%的折扣。
- **Companies that agree to and achieve GHG emissions reduction targets receive an 80% Climate Change Levy discount**
- 如果公司没有加入此协议，没有达到减排目标，则必须缴纳100%的能源税。
- **Company that does not enter into an agreement that does not reach its target, must pay 100% of the energy tax**

英国气候变化协议

UK Climate Change Agreements



政策和方案的支持

- 碳信托基金会：是一个独立的机构，促进降低工业中的碳排放和商业发展。通过实地考察指导公司，并向提高能效的项目提供信息和低成本的贷款。
- 加强资本免税额计划：如公司购买节能设备（在政府制定的具体名单上），则可在进行投资的当年，在这一支出上获得**100%**的免税。
- 国内排放交易计划
- 对能效政策的“轻触摸”

英国气候变化协议

UK Climate Change Agreements



结果：

Absolute Savings from Baseline	Target (MtCO ₂ /year)	Actual (MtCO ₂ /year)
Target Period 1 (2001-2002)	6.0	16.4
Target Period 2 (2003-2004)	5.5	14.4
Target Period 3 (2005-2006)	9.1	16.4
Target Period 4 (2007-2008)	11.1	20.3

Source: AEA Energy & Environment, 2009.

- 这比预期要好，是因为工业领域低估了他们能够通过提高能效实现的减排量。
- 工业能够实现每年节约8亿3千2百万美元，是因为达到了英国气候变化协议的目标。



美国EPA工业能源之星



- 美国政府部门的自愿项目，旨在通过提高能效，帮助生产商保护环境
- 超过450合作公司，涉及工业各个领域
- 为能源管理者提供能源管理信息
- 促进信息共享、网络和共识
- 能源指南—为企业和能源管理者提供技术评价报告
- 企业能源性能指标，以同能效进行对标

工业能效技术和措施

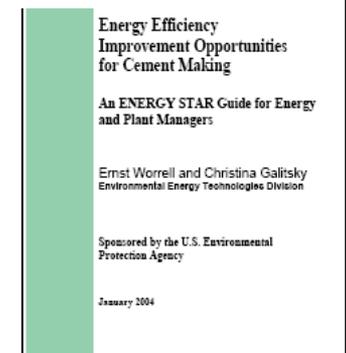
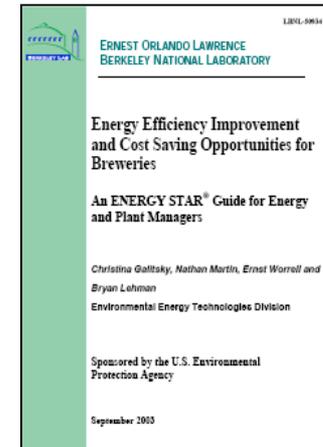
Energy-Efficiency Technologies for Industry



- 美国EPA能源之星的工业项目

US EPA Energy Star for Industry Program (with # of measures for each)

- | | |
|----------------|--------------------------|
| — 汽车装配: 93 | Auto assembly: 93 |
| — 酿造: 45 | Breweries: 45 |
| — 水泥: 40 | Cement: 40 |
| — 玉米加工: 95 | Corn Refining: 95 |
| — 食品加工: 150 | Food processing: 150 |
| — 玻璃: 114 | Glass: 114 |
| — 石化: 100 | Petrochemicals: 100 |
| — 石油炼制: 90 | Petroleum refining: 90 |
| — 医药: 102 | Pharmaceuticals: 102 |
| — 纸浆和造纸 (在进行中) | Pulp and Paper (ongoing) |



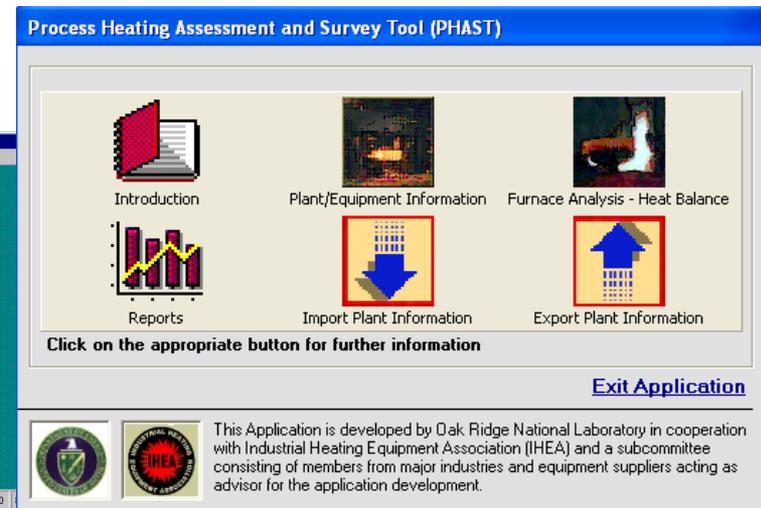
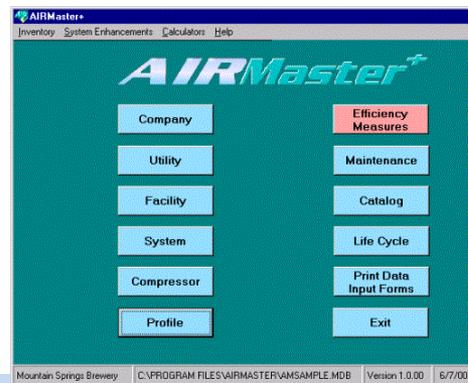
美国能源部的能源工具

U.S. Department of Energy Tools



- AIRMaster+
- Combined Heat and Power (CHP)
- Fan System Assessment Tool (FSAT)
- MotorMaster+
- NO_x and Energy Assessment (N_xEAT)
- Process Heating Assessment and Survey Tool (PHAST)
- Quick Plant Energy Profiler (PEP)
- Steam Systems

- **AIRMaster+**
- 热电联产
- 风机系统评价工具
- 电机
- 氮氧化物和能源评价
- 工艺热评价和调查工具
- 快速了解企业能源概况
- 蒸汽系统



确定节能措施

Identify Energy Efficiency Measures



美国EPA工业能源之星-能源指南

U.S. EPA Energy Star for Industry - Energy Guides

- 水泥行业 Cement
- 钢铁行业 Iron and Steel
- 玻璃行业 Glass
- 石油加工行业 Petroleum Refining
- 纺织工业提高能效的机会 Textiles
- 啤酒厂提高能效的机会 Breweries
- 化工行业（草稿） Chemicals (draft)
- 造纸行业（草稿） Pulp and Paper (draft)
- 石油化工行业（草稿） Petrochemicals (draft)
- 制药业（草稿） Pharmaceuticals (draft)

能源技术解决方案 Energy Technology Solutions

- >220 项商业化的技术
>220 commercialized technologies

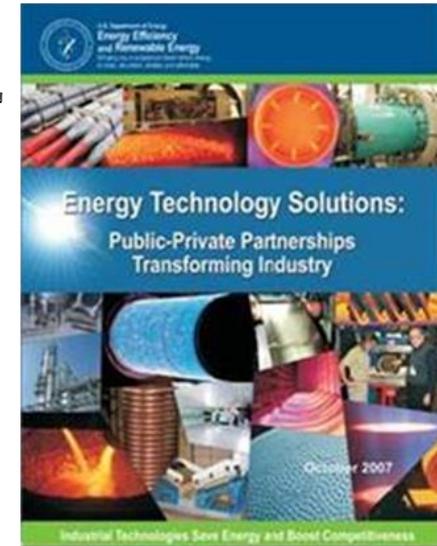


ERNEST ORLANDO LAWRENCE
BERKELEY NATIONAL LABORATORY

水泥行业提高能效的机会

Ernst Worrell, Christina Galitsky and
Lynn Price

劳伦斯伯克利国家实验室
环境与能源技术部



建筑与电气设备 Buildings & Appliances



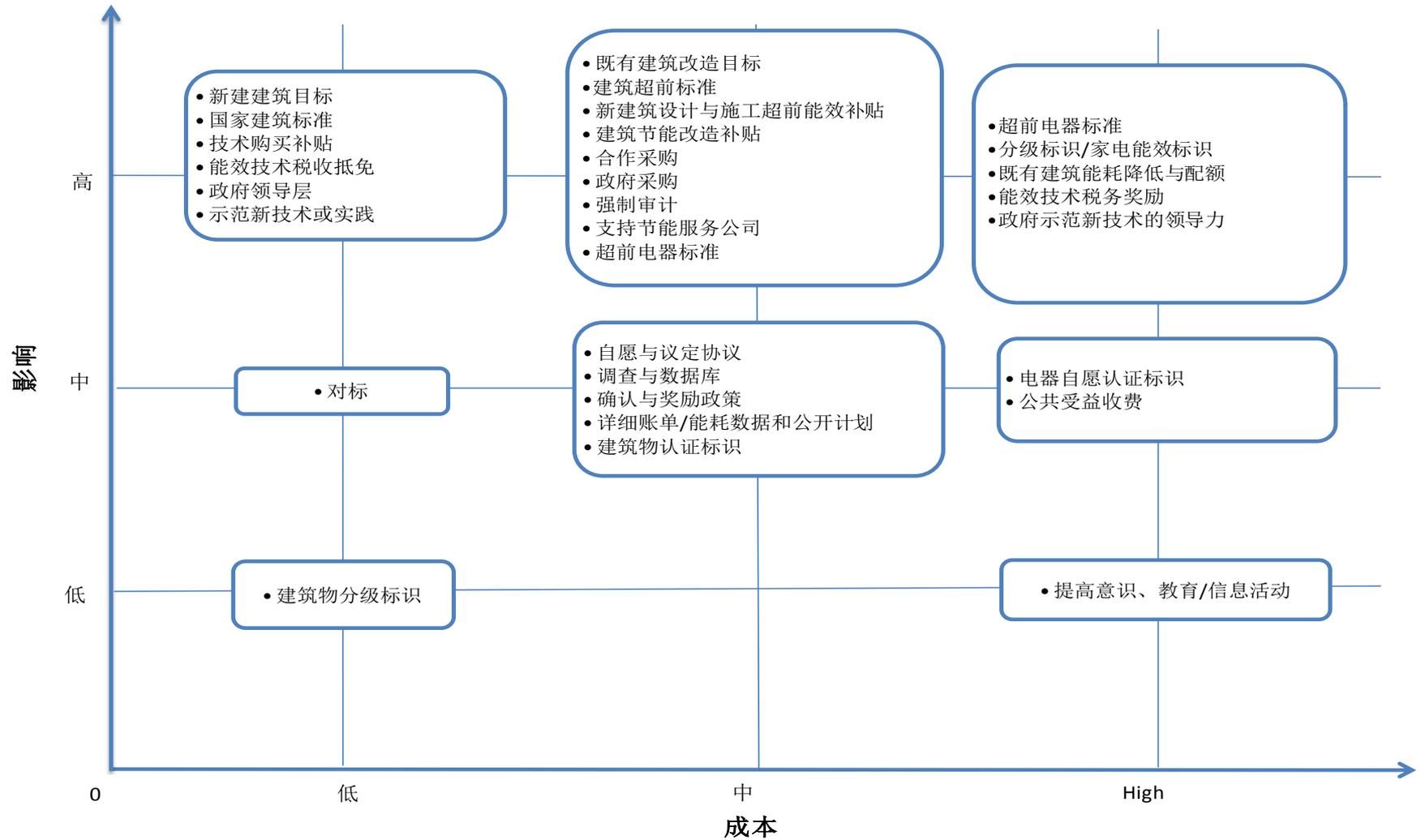
1. 更严格的建筑能效标准
More Stringent Building Codes

2. 最低能源效率标准
Leading Appliance Standards

3. 净零排放建筑
Target Net-Zero Energy Buildings

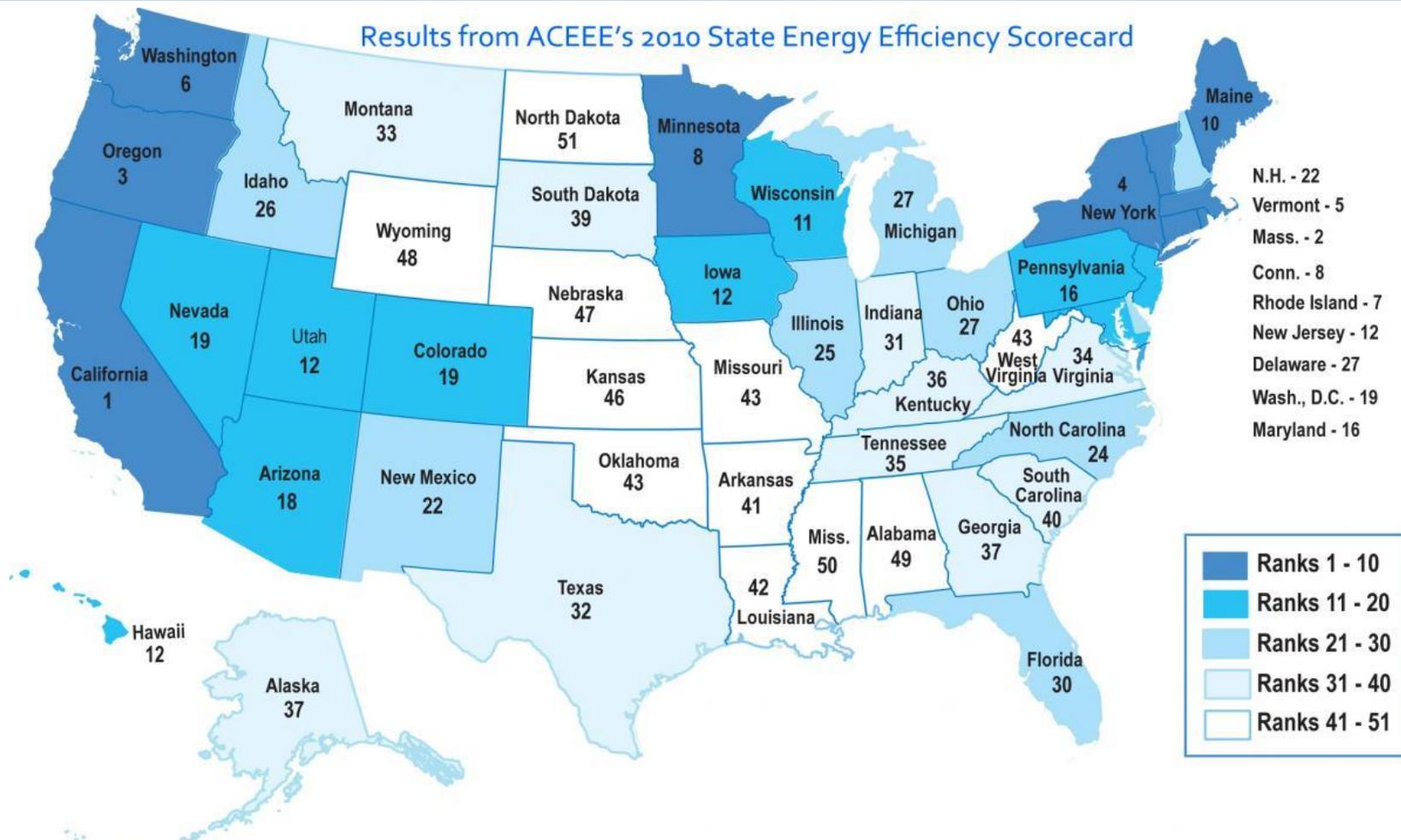
4. 税收和财政激励
Tax Credits & Incentives

低碳发展政策实践菜单及成本与效果：建筑



美国州级能效打分排行榜

The U.S. State Energy Efficiency Scorecard Ranks



- based on six criteria: utility and public programs and policies, transportation policies, building energy codes, combined heat and power, state government initiatives, and appliance efficiency standards.
- 20 states have commercial building codes that meet or exceed ASHRAE 90.1-2007, 2009 IECC, or an equivalent building code

领先标准：州的建筑，家电能效标准可以比联邦的标准高



ASHRAE1999标准和加州2001建筑标准的节能潜力比较

Percent Savings against California 2001

Percent Savings Against ASHRAE 99	All Buildings	Assembly	Office	School	Retail/ Wholesale
20%	8%	13%	12%	16%	-4%
30%	18%	22%	22%	26%	8%
40%	28%	31%	32%	37%	19%
50%	37%	41%	42%	47%	30%
60%	49%	50%	52%	58%	41%

The table demonstrates the bottom line comparison between the two standards. For example, to be 20% better than ASHRAE is equivalent to be 8% better than Title 24.

http://www.cmacn.org/energy/standards/overview_comparison.htm

电力 Electric Power



1. 可再生能源配额和绿色电力调度
Renewable Portfolio Standards (RPS) & Environmental Generation Dispatch

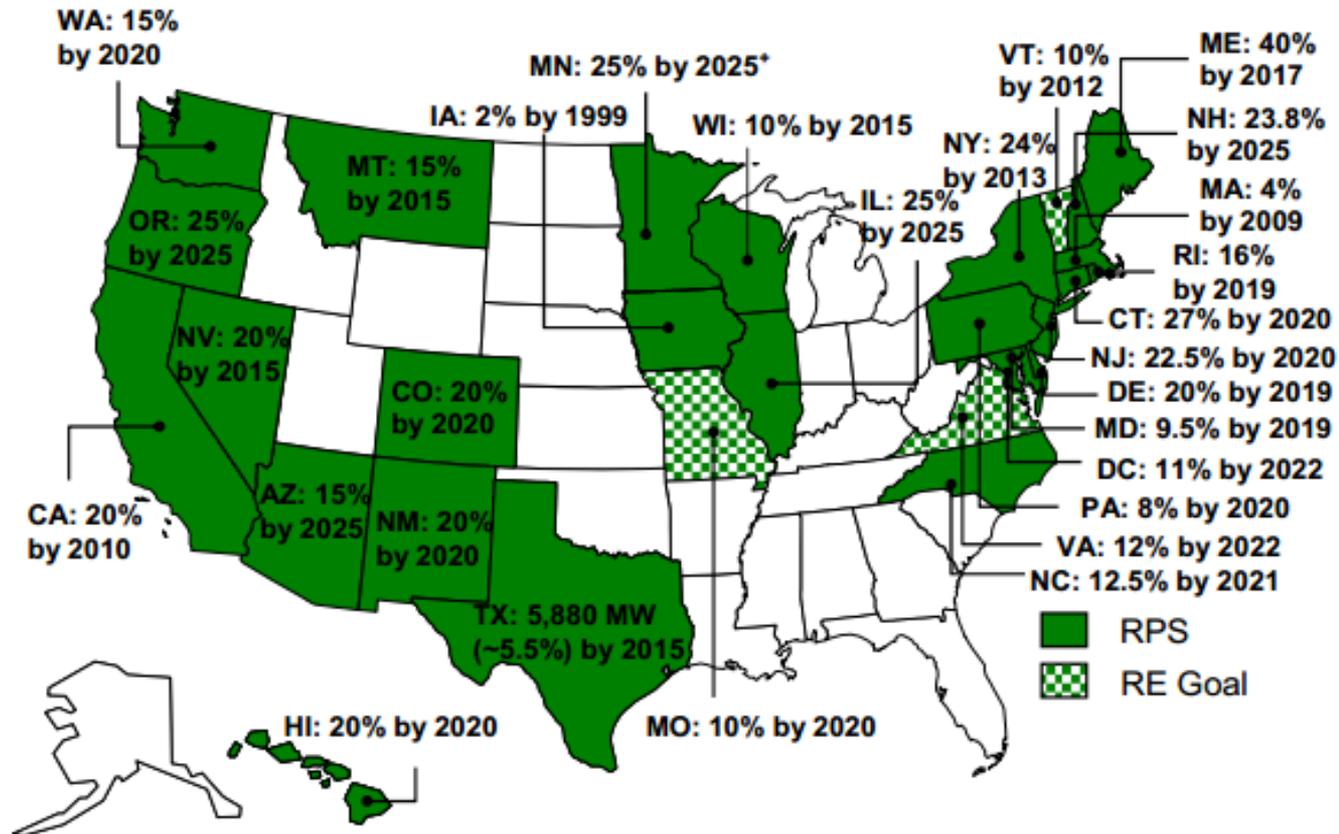
2. 价格信号：分时电价、阶梯电价和差别电价

Signal with Prices: Time-of-Use, Inverted Block and Differential Pricing

3. 用户侧管理和公益基金

Utility Programs for Energy Saving: Utility DSM Programs and Public Benefits Funds

可再生能源配额 (RPS)



- 美国，可再生能源配额已在21个州和华盛顿特区施行

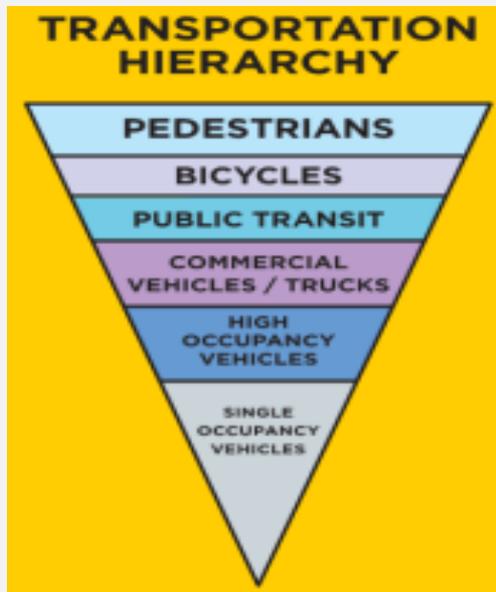
价格信号: 分时电价、阶梯电价和差别电价



- **分时电价**给出的是一个具体的时间表，规定在不同时间段内的电价水平，包括高峰、部分非高峰期和非高峰期的不同电价。
- **阶梯电价**由基本（固定）用电量和固定的价格以及超出基本电量后阶梯上涨的较高电价构成。例如，在加州北部，对于基本用电量之内的电力，给予每千瓦时0.86人民币的基本电价，当用电量处于基本用电量的101%到130%、131%到200%的范围内，分别给予1.01人民币/千瓦时、2.02人民币/每千瓦的电价。
- **差别电价**根据不同的客户类型设置不同的价格水平。

交通：城市组织和流动性

Transportation & Urban Form



1. 充满活力的社区和街道：非机动车交通优先系统

Vibrant Neighborhoods & Streets for People

2. 综合运输发展

Integrated Transit Development

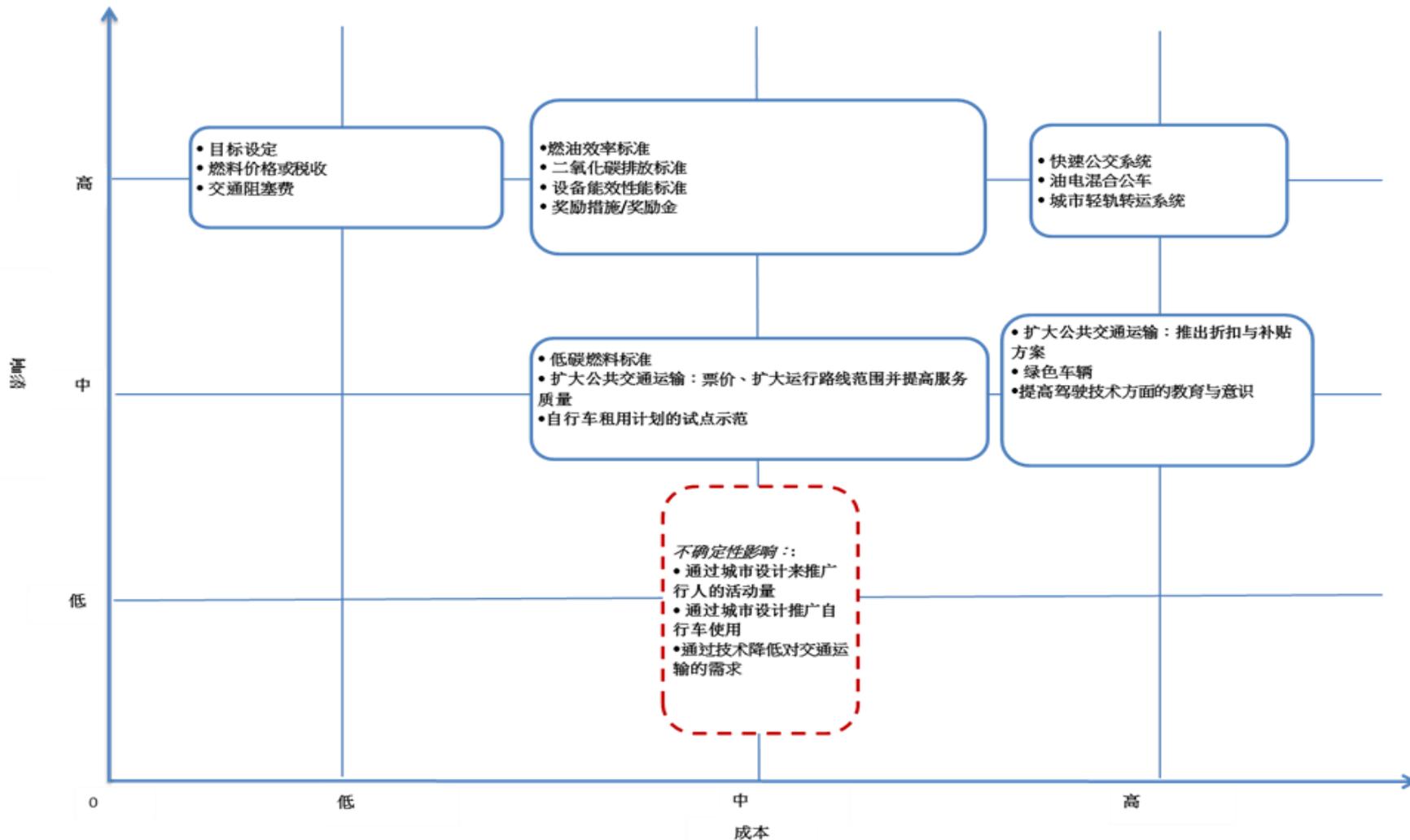
3. 更短的距离、更通畅的流动性：货物和乘客

Less Distance, Better Flow

4. 高效、低碳交通工具

Efficient, Low Carbon Vehicles

低碳发展政策实践菜单及成本与效果：交通



运输部门能效政策的成本与温室气体减排量

注释：红色虚线方块为难以量化的政策影响力与不确定的成本

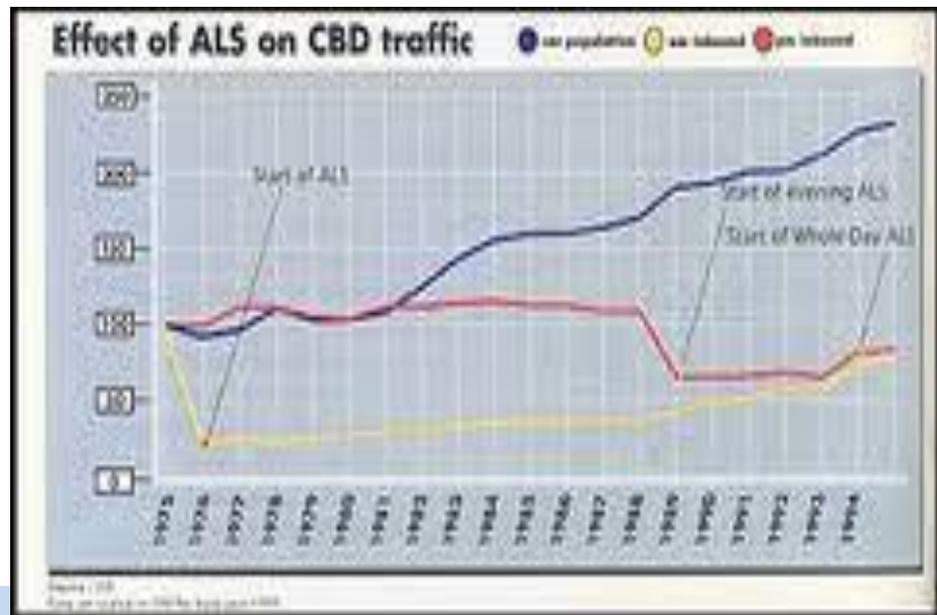
规划分区: Zoning



- **政策:**
- “加利福尼亚州智能化土地利用”规划中，推广工作和住宅近距离，鼓励主要交通要道沿线发展高密度住宅/商业区，达到显著的节能和二氧化碳减排。
- 马萨诸塞州的波士顿市在2007年实施了一个绿色建筑规划分区标准。
 - 这个分区规范要求所有超过5万平方英尺的主要建筑项目需达到美国绿色建筑委员会的LEED认证标准。
 - 建筑标准是在州政府的管辖之下，波士顿市有很少的自主权去改变建筑标准。
 - 规划委员会修订了可直接控制的城市规划分区标准。
 - 促使新建建筑成为应用被动供暖和冷却以及可再生能源技术的绿色建筑。
- **衡量标准**
- 规划分区的绩效衡量标准是受分区规则影响的土地面积和分区要求的整体严格性

交通部门政策示例：交通堵塞费

- 在容易堵车的时段与地点，对乘客收取较高的费用，以改变乘车行为，并舒缓交通。
- 为使其更公平，可将公共运输产生的盈余与交通堵塞费营收再进行分配投资。在伦敦，法律规定必须将交通堵塞费产生的净营收投资于改善交通运输系统。
- 很多国家与州已实施交通堵塞费，如新加坡、挪威、美国、英国伦敦。但收费机制各有不同，在伦敦，周一至周五早上七点至晚上六点半，进入市中心特定区域的车辆必须要支付9英镑至12英镑不等的交通堵塞费。
- 新加坡在1998年为每日收费，目前改用电子道路收费，只有在每次进入该城市时才收费。该机制相当复杂，收取的费用会因车辆、进城时间不同而出现差异，票价每三个月评估一次。

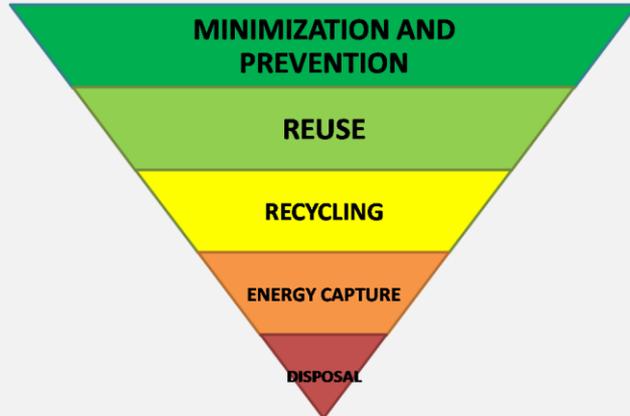


消费和废弃物管理 Consumption & Waste

1. 减量化：废弃物的减量和再利用
Source Reduction: Reduce and Re-Use Waste

2. 回收利用和堆肥
Recycling & Composting

3. 垃圾填埋气回收
Landfill Methane Recovery



旧金山：零垃圾目标和强制性回收和堆肥条例

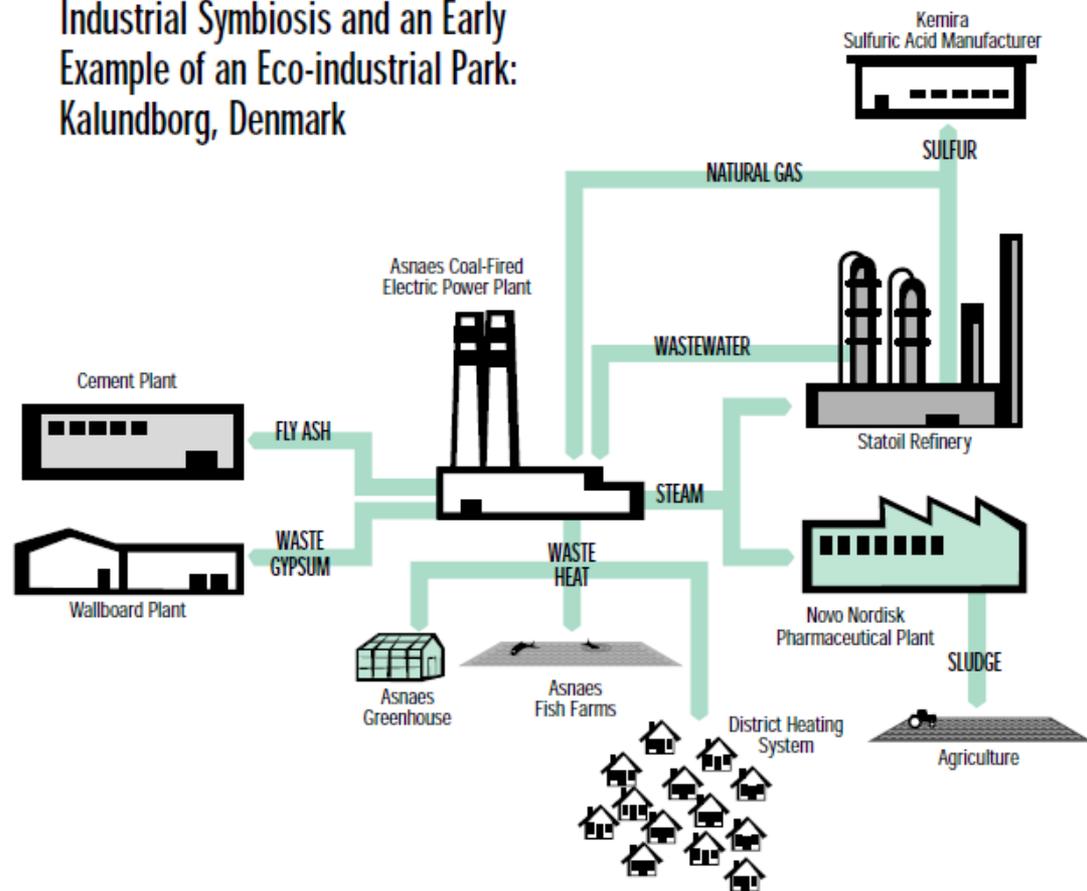
- 2001年完成州政府强制50%的垃圾填埋场废物转化目标
- 2003年提出到2010年75%的废弃物采用多样性处理方式
- 2020年实现垃圾填埋场或焚烧场的零垃圾
- 企业、小区业主和租房者将免费获得回收和堆肥的容器、工具包、相关教材和培训
- 规定强制执行的要求和惩罚措施
- 其他配套政策包括减少塑料袋、减少建材包装材料、户内垃圾的回收和收购政策等



建立“工业共生体系”提高工业固体废弃物综合利用率：丹麦卡伦堡生态工业园

- 世界生态工业园建设的典范
- 工业共生体系：企业间相互交换废料
 - 发电厂
 - 炼油厂
 - 生物工程公司
 - 石膏材料公司
 - 市政供暖公司
 - 其它：硫酸厂、水泥厂、农场
- 能源和副产品企业间多级重复利用：减少60%用水；节煤3万吨、节约石油1.9万吨；每年经济效益超过1000万美元

Industrial Symbiosis and an Early Example of an Eco-industrial Park: Kalundborg, Denmark



农业和林业：核心低碳政策

农业和林业 Agriculture & Forestry



1. 本地的和健康的食品和农业
Local Agriculture, Healthy Food

2. 有机农业和安全的食品
Organic Agriculture, Safe Food

3. 城市森林：保护和清洁
Urban Forestry: Protect & Clean

4. 城市绿色空间
Urban Green Spaces

有机农业和安全食品



- 中国的农业生产严重依赖化肥和农药，污染了土地和水体，它们的生产过程消耗很多能源，而且对人体和其他生物毒性非常强
- 政府可以对有机食品的认证提供补贴、为从事有机农业的农民提供培训和咨询服务，逐步停止对化肥产业的补贴，逐步把补贴向有机农业产业过渡
- 政府可以促进本地的有机堆肥，建立堆肥中心，从而减少化肥的使用，同时使得土壤结构更加平衡和健康
- 有机农业的收益大约比传统农业高出3倍

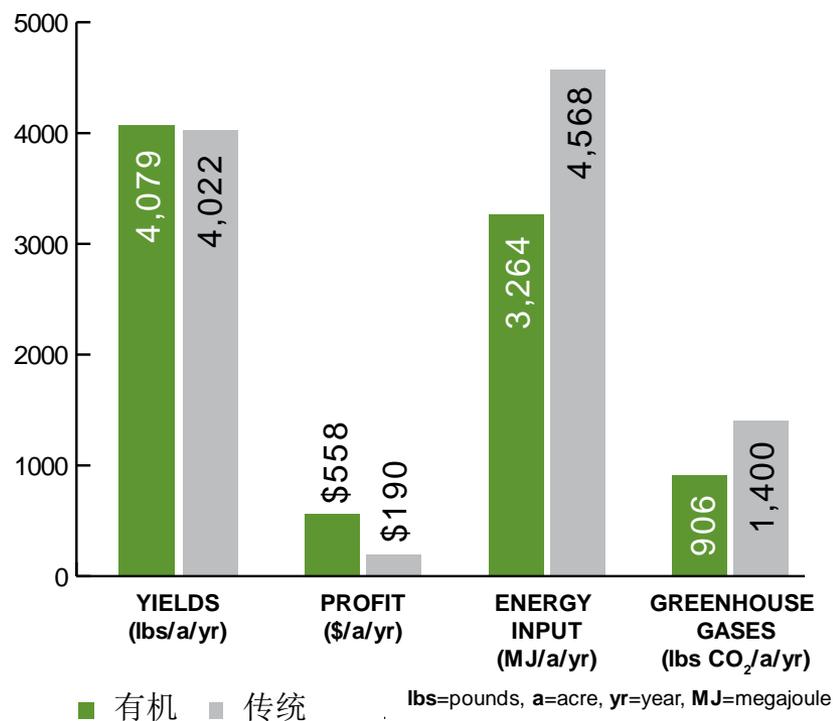


图 14. 有机农业和传统农业对比

城市森林：保护和清洁

- 《纽约城市规划》（PlaNYC）的一个目标是让所有纽约人在十分钟内可以步行到一个公园
- 目前纽约有超过52000英亩的公园用地，占城市总面积的25%
- 城市中最具创新性的高架线公园，把旧的交通设施改造成一个公共聚会空间和一件艺术作品，节约了能源，减少了碳排放



图 16. 高架公园改造前：未使用的高架铁道，从十八大街向北



图 17. 高架线公园改造后：一个城市绿洲

最佳低碳城市政策推荐工具 (BEST-Cities)



BEST Low Carbon Cities

BEST Low Carbon Cities File Menu Zoom

BEST LOW CARBON CITIES
BENCHMARKING & ENERGY SAVING TOOL FOR LOW CARBON CITIES

BEST Low Carbon Cities
TEST CITY F

Inventory and Benchmarking

Input city data, see inventory results, compare performance with other cities.

- City & Sector Data
- Energy & Carbon Inventory
- Benchmark Results

Sector Prioritization

Identify the sectors with highest potential for carbon saving.

- Sector Improvement Potential
- City Authority
- Sector Prioritization Results

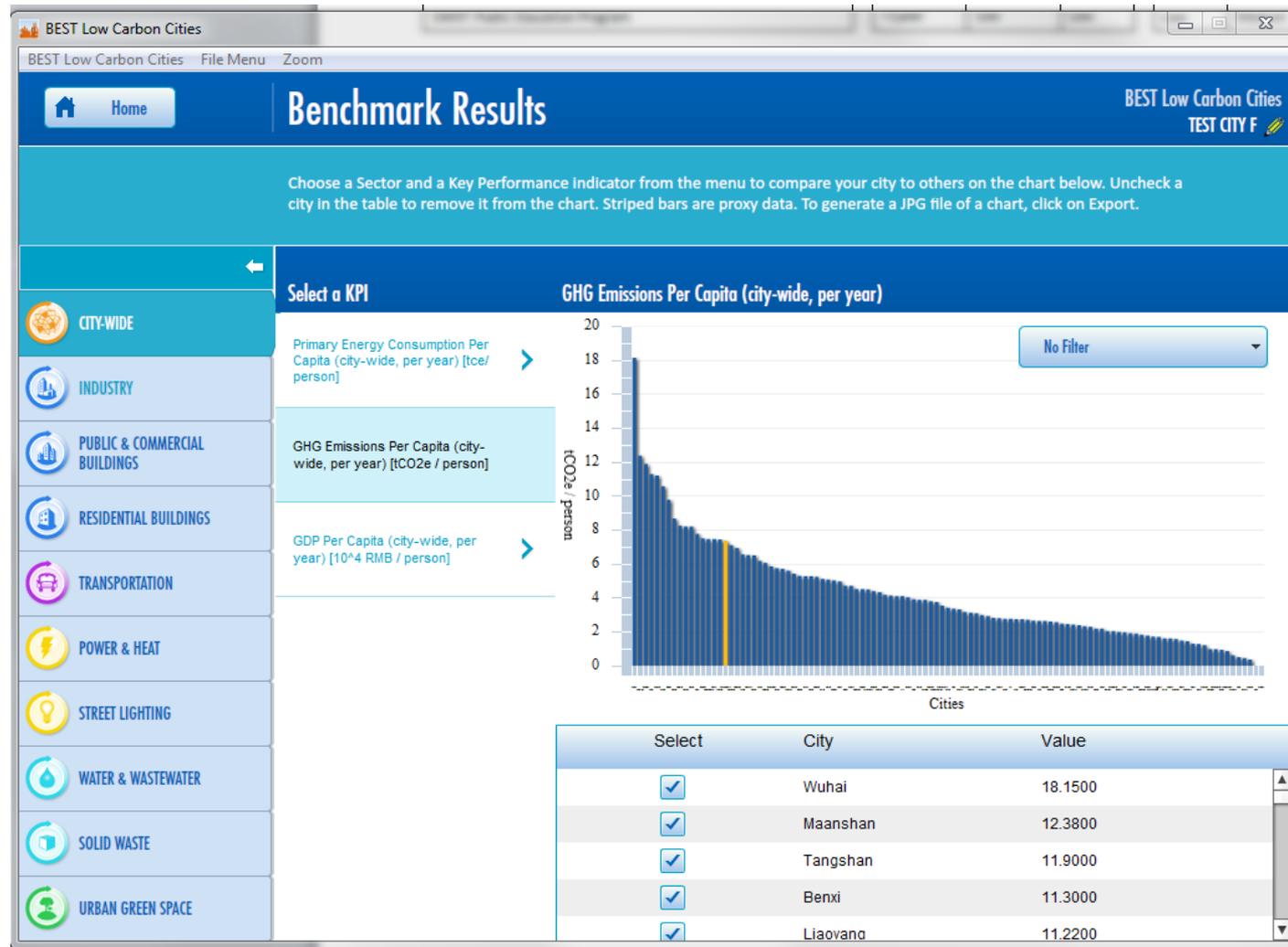
Policy Analysis

Find policies and programs for carbon saving across city sectors

- City Capability
- Policy Appraisal
- Policy Review
- Policy Matrix
- Priority Policies

Documents

和国际国内城市指标对标



部门能源和碳排放清单



BEST Low Carbon Cities

BEST Tool File

Home

Energy & Carbon Inventory

BEST Low Carbon Cities
Test

Data Tables

Data collated during the pre-mission phase, using the templates provided should be entered here. Go through each of the tabs on the left to access each sector. Don't forget to add the year and source of the data. If a proxy has been used (e.g. national data), check the box on the right and enter the year and source.

Public & Commercial Buildings Energy and Carbon

	Fuel	Energy (TCE)	CO2e Emissions (10 ⁴ CO2e)
CITY-WIDE	Coal	0	0
INDUSTRY	Electricity	0	0
PUBLIC & COMMERCIAL BUILDINGS	Fuel Oil	0	0
	Heat	0	0
RESIDENTIAL BUILDINGS	LPG	0	0
TRANSPORTATION	Natural Gas	0	0
	Other Coal Gas (Town Gas)	0	0
POWER & HEAT	Public & Commercial Buildings Sector Total	0	0
STREET LIGHTING			
WATER & WASTEWATER			
SOLID WASTE			
URBAN GREEN SPACE			

识别城市最大节能减排潜力部门

BEST Low Carbon Cities

BEST Low Carbon Cities File Menu Zoom

Home

Sector Prioritization Results

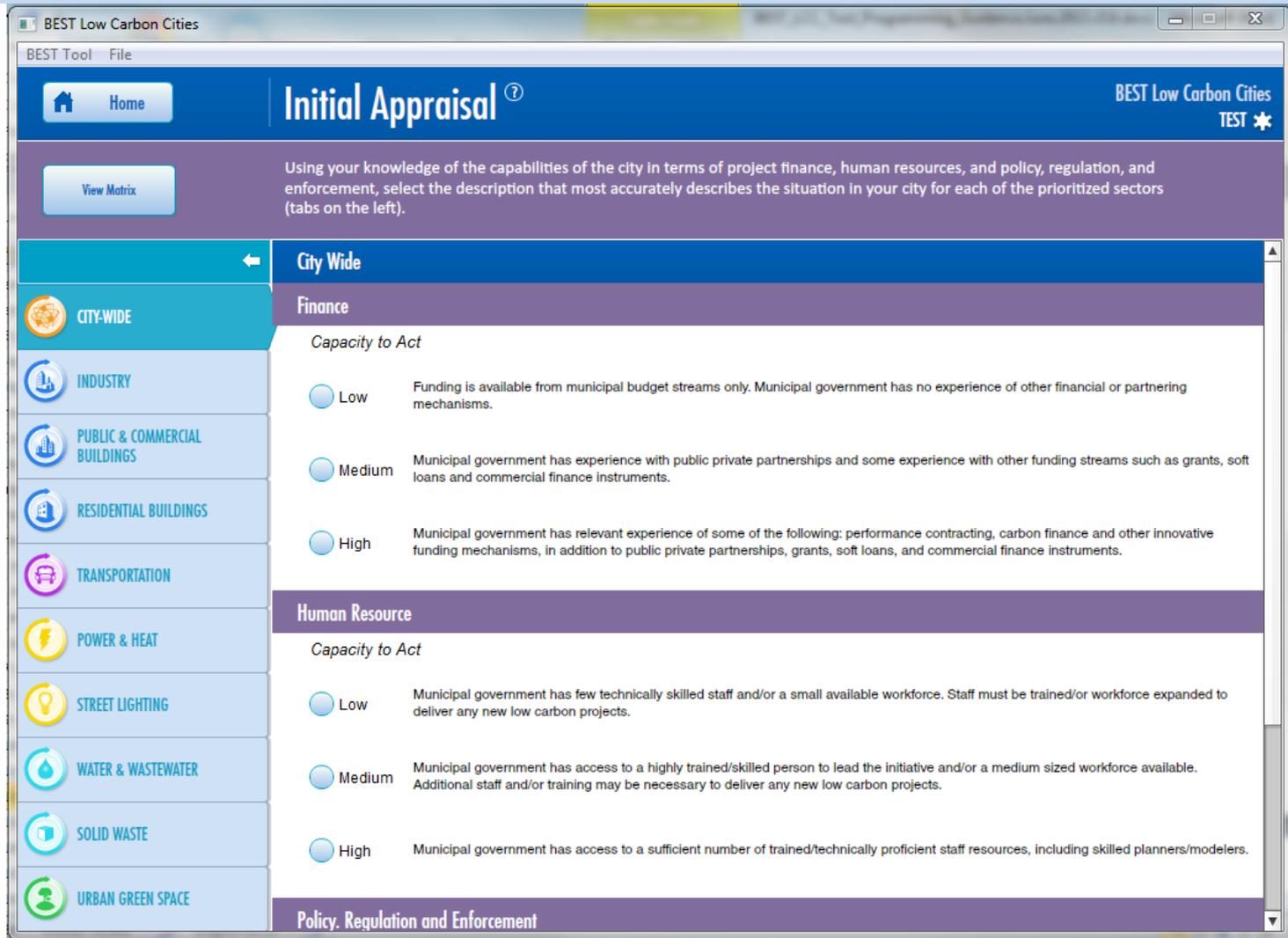
BEST Low Carbon Cities
TEST CITY F

9 of 9
selected

The list below shows the priority ranking of each sector, based on the Sector Improvement Potential, the magnitude of CO₂e emissions, and the sector City Authority assessment. The overall sector Score is determined by the following calculation:
Sector Improvement Potential (%) x Sector CO₂ Emissions (1Q⁴ tCO₂e) x City Authority

Rank	Sector	Sector Improvement Potential %	CO ₂ e Emissions (1 [▲])	City Authority %	Score	Check priority sectors
9	Urban Green Space	10%	-34,680.00	90%	-312,120.00	<input checked="" type="checkbox"/>
8	Water & Waste Water	%	0.00	20%	0.00	<input checked="" type="checkbox"/>
6	Streeting Lighting	9%	0.04	75%	0.33	<input checked="" type="checkbox"/>
1	Power & Heat	19,720%	1,150.79	20%	4,538,730.29	<input checked="" type="checkbox"/>
4	Residential Buildings	10%	1,190.46	75%	8,928.48	<input checked="" type="checkbox"/>
5	Municipal Solid Waste	10%	110.34	65%	717.26	<input checked="" type="checkbox"/>
7	Transportation	0%	196.22	35%	0.00	<input checked="" type="checkbox"/>
3	Public & Commercial Buildings	20%	3,450.41	50%	34,504.11	<input checked="" type="checkbox"/>
2	Industry	15%	6,859.63	35%	36,013.09	<input checked="" type="checkbox"/>

政策初级评价



The screenshot shows the 'BEST Low Carbon Cities' web application. The main heading is 'Initial Appraisal'. A 'View Matrix' button is visible. The left sidebar contains a list of sectors: CITY-WIDE, INDUSTRY, PUBLIC & COMMERCIAL BUILDINGS, RESIDENTIAL BUILDINGS, TRANSPORTATION, POWER & HEAT, STREET LIGHTING, WATER & WASTEWATER, SOLID WASTE, and URBAN GREEN SPACE. The 'CITY-WIDE' sector is selected, and the 'Finance' sub-section is active. The 'Capacity to Act' section for Finance lists three levels: Low, Medium, and High, each with a radio button and a descriptive paragraph. The 'Human Resource' section is also visible, with its own 'Capacity to Act' section. The bottom of the page shows the 'Policy, Regulation and Enforcement' section.

BEST Low Carbon Cities

BEST Tool File

Home Initial Appraisal [?] BEST Low Carbon Cities TEST ✨

View Matrix

Using your knowledge of the capabilities of the city in terms of project finance, human resources, and policy, regulation, and enforcement, select the description that most accurately describes the situation in your city for each of the prioritized sectors (tabs on the left).

← City Wide

CITY-WIDE

INDUSTRY

PUBLIC & COMMERCIAL BUILDINGS

RESIDENTIAL BUILDINGS

TRANSPORTATION

POWER & HEAT

STREET LIGHTING

WATER & WASTEWATER

SOLID WASTE

URBAN GREEN SPACE

Finance

Capacity to Act

Low Funding is available from municipal budget streams only. Municipal government has no experience of other financial or partnering mechanisms.

Medium Municipal government has experience with public private partnerships and some experience with other funding streams such as grants, soft loans and commercial finance instruments.

High Municipal government has relevant experience of some of the following: performance contracting, carbon finance and other innovative funding mechanisms, in addition to public private partnerships, grants, soft loans, and commercial finance instruments.

Human Resource

Capacity to Act

Low Municipal government has few technically skilled staff and/or a small available workforce. Staff must be trained/or workforce expanded to deliver any new low carbon projects.

Medium Municipal government has access to a highly trained/skilled person to lead the initiative and/or a medium sized workforce available. Additional staff and/or training may be necessary to deliver any new low carbon projects.

High Municipal government has access to a sufficient number of trained/technically proficient staff resources, including skilled planners/modelers.

Policy, Regulation and Enforcement

72条政策推荐

BEST Low Carbon Cities

BEST Low Carbon Cities File Menu Zoom

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All recommendations that were selected are displayed below along with their attributes. Where user input has been entered for CO₂ Emissions Reduction Potential, the attribute value has been updated to show a standard range in which the entered value falls.

For a city of 5 million - 9,999,999 population:					
Recommendation	Sector	Estimated Speed of Implementation	Estimated Carbon Impact Potential (\$)	Estimated First Cost (\$)	Override
Active Leak Detection and Pressure Management Progr...	Water & Waste Water	1-3 Years	< 500,000	< 5 million	Override
Anaerobic Digestion	Municipal Solid Waste	1-3 Years	< 500,000	< 5 million	Override
Audit and Retrofit Programs	Streeting Lighting	1-3 Years	< 500,000	< 5 million	Override
Benchmarking	Industry	1-3 Years	< 500,000	< 5 million	Override
Bike Share Programs	Transportation	1-3 Years	500,000 – 2.5 million	5 million - 50 million	Override
Building Energy Labeling and Information Disclosure	Public & Commercial Buildings	1-3 Years	500,000 – 2.5 million	5 million - 50 million	Override
Building Energy Labeling and Information Disclosure	Residential Buildings	1-3 Years	500,000 – 2.5 million	5 million - 50 million	Override
Building Workforce Training	Residential Buildings	< 1 Year	< 500,000	> 50 million	Override
City Energy and Heat Maps	Public & Commercial Buildings	< 1 Year	< 500,000	< 5 million	Override
City Energy and Heat Maps	Residential Buildings	< 1 Year	< 500,000	< 5 million	Override
Codes, Consumer Education, and Incentives for Water-E...	Water & Waste Water	< 1 Year	< 500,000	< 5 million	Override
Commuting Programs	Transportation	< 1 Year	500,000 – 2.5 million	< 5 million	Override
Complete Streets	Transportation	1-3 Years	< 500,000	< 5 million	Override
Congestion Charges, Tolls, Electronic Road Pricing	Transportation	1-3 Years	500,000 – 2.5 million	< 5 million	Override
Cooperative Procurement of Green Products	Public & Commercial Buildings	< 1 Year	> 2.5 million	< 5 million	Override

- 政策描述
- 执行战略和挑战
- 案例研究
- 减排潜力
- 初始成本
- 执行速度
- 其他效益

Energy Audit / Assessments

Description

Conducting an energy audit or assessment of an industrial enterprise involves collecting data on the major energy-consuming processes and equipment in a plant as well as documenting specific technologies used in the production process and identifying opportunities for energy efficiency improvement throughout the plant, typically presented in a written report. Standardized tools, informational materials, and other energy-efficiency products are often provided during the audit. Some audit programs, like the U.S. Department of Energy's Energy Savings Assessments program, provide a directory or network of accredited auditors.

Energy audits or assessments are sometimes coupled with benchmarking, as a way to quickly identify the energy-savings potentials before conduct a full energy assessment. For more information on benchmarking, please see policy I01. To incentivize use of energy audits or assessments as well as adoption of recommended energy efficiency technologies and measures, fiscal incentives, such as fiscal rewards (I05), energy efficiency loans and funds (I06), or tax relief (I07) can be provided. Other policies, such as a national or sub-national energy or CO₂ taxes (I08) or differential electricity pricing (I10) could also incentivize industrial plants to achieve higher savings through conducting energy audits and implementing the recommended energy-saving measures.

Implementation Strategies and Challenges

Implementation Activity	Description
Identify implementing organization	The local government designates an existing governmental agency, a local research institution, or a third party to implement the energy auditing

Policy Attributes (Generic Estimate)

Carbon Savings Potential

Medium

First Cost to Government

Medium

Speed of Implementation

1-3years

Policy Attributes (Estimate for Your City Size)

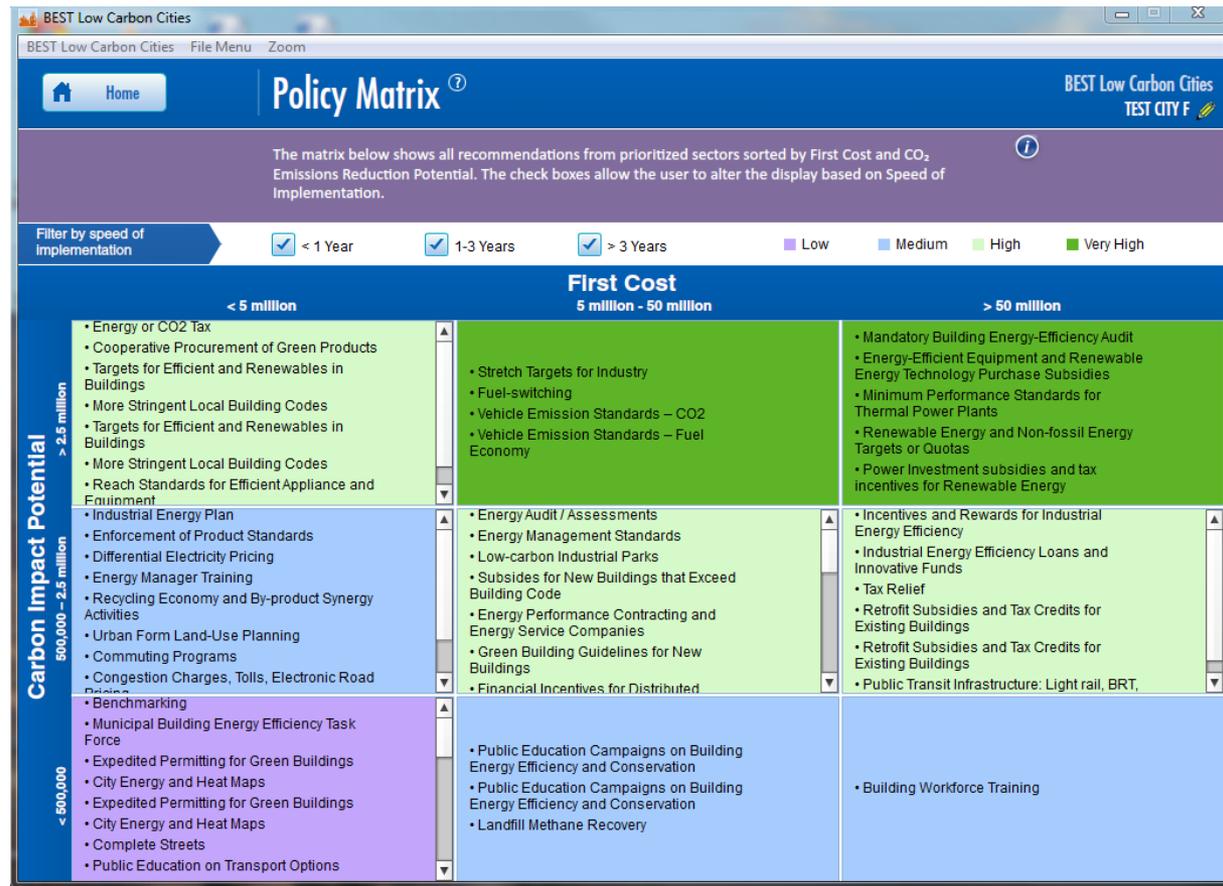
Carbon Savings Potential

First Cost to Government

Speed of Implementation

政策优先矩阵

- Recommended policies in four “priority” categories:
 - Very high priority
 - High priority
 - Medium priority
 - Low priority



谢谢!
Thank you!



- 如要获得更多信息，请联系：
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